JT-NM TESTED AUGUST 2022 JT-NM Tested Board Report IP Media Equipment Testing For Interoperable Future





CONTENT

- What is JT-NM Tested?
- What did we test and why?
- Test plans and tools
- Network and Infrastructure

EBU

• Findings and results

vrt CBC (Radio-Canada

BBC R&D

Conclusions



JT-NM Tested Program – What is it?

- The JT-NM Tested program offers documented insight into how vendor equipment conforms to specific SMPTE standards and AMWA NMOS specifications.
- Vendors who meet the testing criteria will have the opportunity to display badges and make public statements about their participation.
- The JT-NM Tested Catalog lists vendor results along with a detailed test plan.
- Anyone with the equipment listed in the test plan may execute the tests which were administered by the JT-NM test team, and you are encouraged to do so.
- It is important to note that the JT-NM Tested program is not a certification program; rather, it is a snapshot in time of how vendor equipment conforms to key parts of SMPTE standards and AMWA NMOS specifications.



JT-NM Tested Program – What did we test?

- 3 main test tracks:
 - Data plane: Network access and SMPTE ST 2110 behaviour (curated by EBU and VRT)
 - Control plane: AMWA NMOS and JT-NM TR-1001-1 behavior, including NMOS registries and controllers (curated by EBU and CBC/Radio Canada)
 - Cybersecurity Vulnerability Assessment (curated by EBU and VRT)



JT-NM Tested Program – Test Plans & Tools

- Test Plans:
 - SMPTE ST 2110 Test plan
 - NMOS/TR-1001-1 Test plan
 - Cybersecurity Test Plan
- Main testing tools:
 - EBU LIST + multiple T&M devices
 - AMWA NMOS Testing Tool

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Joint Task Force on Networked Media Joint Task Force on Networked Media Joint Task Porce on Networked

"JT-NM Tested Program August 2022" SMPTE ST 2110 Test Plan v.1.2

Changelog to v1.1

 This is a post-face-to-face event update that reflects the changes introduced by the testing and experts teams on-site and outlines additional support equipment used during the testing.

Changelog to v1.0

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Test 3.3 updated.

Changelog to "JT-NM Tested March 2020 Program" Test Plan v.1.3 (pre-COVID)

- Pre-COVID on-site test plan v.1.3. is used as the basis for this revision
- Initial release. This document may undergo changes ahead of the final version.
 It is recommended that participants of previous JT-NM Tested events carefully familiarit
- themselves with the new revision of the test plan.
- Editorial corrections and ambiguities resolution throughout the tex
 PTP Testing simplified.
- PTP Testing simplified.
 Added ST 2110-22/JPEG-XS tests.
- Minor improvements to multiple tests.
- Clarified timestamp behavior in ST 2110-30 and ST 2110-31 tests and added sender jitter tests.

Notation used in the document

JT-NM Tested Catalog results are presented as a capability map. This allows readers, especially and users, to focus on the capabilities demonstrated by devices during the JT-NM Tested event. JT-NM Catalogu use the following terms to characterize test results:

Capable (green mark): A test item marked as 'capable' means a device has demonstrated a capability that was requin as part of a test listed in a JT-NM Tested Test Plan. JT-NIT TESHCA JULUS 2022 Program

Joint Taskforce on Networked Medi

JT-NM Tested August 2022 Program NMOS/TR-1001 Test Plan v1.2

September 2022

t update that reflects the changes introduced by the testing sutlines additional support equipment used during the

1 August 2022 ting Tool Configuration and an example of UserConfig.py

CA and generateCerts sns with the NMOS Test Suite Controller allowing embedded Registry in a Controller

A Tested March 2020 Program" Plan v1.4", 11 July 2022

gram" NMOS/TR-1001 Test Plan v1.4 is used as the basis

vay undergo changes ahead of the final version. Tested events carefully familiarise themselves with the new

alities resolution throughout the text. r Modia Nodes' Discovery of System Parameters and the contated test cases of the NMOS Testing Tool. size Communication waver Capabilities. ng the new test sub for Controllers.

BBC R&D Vrt CBC @ Radio-Canada EBU

THE TECHNOLOGY PYRAMID FOR MEDIA NODES

Minimum User Requirements to Build and Manage an IP-Based Media Facility using Open Standards & Specifications.





NETWORK AND INFRASTRUCTURE

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JT-NM Tested Program – Network and infrastructure

Objectives:

- Provide a "real-world" scenario
- Highlight ST 2110 network design best practice
- Resilience and Reliability through design

Solution:

- Spine-leaf topology, Amber and Blue media networks
- Routed access
- BGP Dynamic routing
- Full multicast routing (IGMP / PIM)
- Multiple management VLANs for general use and NMOS testing

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- Dual resilient PTP GMs
- Routable OOB network for switch management

JT-NM Tested Program – Network and infrastructure

- 16 switches in total:
 - 2x spine
 - 10x leaf
 - 4x OOB management
- Number of ports:
 - 48x 100G
 - 8x 40G
 - 116x 25G
 - 75x 10G
 - 215x 1G (Both media and management)
- A strong move from 10G to 25G, and from 40G to 100G.



JT-NM Tested Program – Network and infrastructure

- PTP:
 - 2x grandmasters by Telestream
- DHCP:
 - 577x scopes
 - Over 5000x lines in the config file
- DNS:
 - DNS-SD for NMOS registry discovery
- NMOS registry:
 - Easy-NMOS by Richard Hastie





FINDINGS AND RESULTS https://jt-nm.org/jt-nm_tested/



Device Under Test Details					1. General Network Interface Tests									2. Media Network Related Tests										3. ST 2110-10 Tests														
					1.1.1	1.1.2	1.1.3	1.2.0	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	2.1.0	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.4.0	2.4.1	2.4.2	2.5.0	2.5.1	2.5.2	3.1.0	3.1.1	3.2.0	3.2.1	3.3.0	3.3.1	4.1.0	4.1.1	4.1.2	4.2.0	4.2.1	4.3.0	
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SMPTE ST 2110 Test Plan (content by Willem Vermost, VRT)



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Download results and test plan!

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Results – SMPTE ST 2110 Test Plan (content by Willem Vermost, VRT)

- 35 vendors published their results in the final catalog.
 - +1 compared to the previous event
- A few newcomers were welcomed
- 84 products were tested against the ST 2110 test plan (142% compared to previous catalog)
- 63 Video devices
 - 44 devices were presented as a UHD capable
 - 39 Tx/Rx devices
 - 13 Rx devices
 - 11 Tx devices
- 17 Audio only devices
 - 13 Tx/Rx devices
- 11K tests executed in total!



Results – SMPTE ST 2110 Test Plan (content by Willem Vermost, VRT)

Network Interface Tests

- 67% use DHCP on management network interface
- 61% use DHCP on Media network interface
- 99% respect the GM role when in "slave only"
- 96% properly react to PTP TLVs
- 57% warn or prohibit the use of the restricted multicast range (224.0.0.0-224.0.1.255)

• ST 2110-10

- 100% support and use IGMPv3 (*,G)
- 67% support IGMPv3 SSM (S,G)



Lessons Learned – ST 2110 (content by Willem Vermost, VRT)

• ST 2110-10

- 67% expose and SDP
- 93% of exposed SDPs were valid
- ST 2110-20
 - 94% produce a valid stream
 - 94% produce a stream within the profile limits of N, NL or W
 - 86% Produce a stream within the boundaries of the VRX limits.
 - 92% can receive Wide streams
- ST 2110-22
 - 25% of the devices demonstrated the ST 2110-22 capabilities





Lessons Learned – ST 2110 (content by Willem Vermost, VRT)

• ST 2110-30

- 96% of the devices demonstrated capabilities for the ST 2110-30 tests
- 77% have recommended DSCP values according to AES67

• ST 2110-31

• 39% of the devices demonstrated capabilities for the ST 2110-31 tests

• ST 2110-40

• 82% of the devices demonstrated capabilities for the 2110-40 tests

• ST 2022-7

- 88% of the devices demonstrated capabilities for 2022-7 tests
- 58% had valid Seamless Protection Switching, critical for designing a resilient facility!





NMOS/TR-1001-1 Test Plan (content by Felix Poulin, CBC/Radio Canada)

Startup Behaviour

Secure Communication (BCP-003-01)

Node API & Registration Behavior (IS-04)

Connection Management (IS-05)

Audio Channel Mapping (IS-08)

System Parameters (IS-09)

Receiver Capabilities (BCP-004-01)

NMOS Registry Tests

vrt CBC (Radio-Canada

BBC R&D

EBU



Download results and test plan!

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Results – NMOS / TR-1001-1 Test Plan (content by Felix Poulin, CBC/Radio Canada)

- 17K tests executed 92% automated!
- Nodes
 - 74 Media Nodes +118% from 2020
 - from 35 vendors + 75% from 2020
 - 87% of ST 2110 Devices tested for NMOS
 - Growing adoption!

Capabilities

- 90% tests passed IS-04 Reg. and Discovery
- 65% do Natural Grouping (BCP-002-01)
- % do Receiver Capabilities (BCP-004-01)
- 91% tests passed IS-05 Connection Management
- Maturity of most of IS-04 and IS-05 implementations!

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Results - NMOS / TR-1001-1 Test Plan (content by Felix Poulin, CBC/Radio Canada)

12% do basic or full Secure Communication (BCP-003-01)

- A beginning, but long way to go!
- 59% do System Parameters (IS-09)
- 19% do Audio Channel Mapping (IS-08)
- 76% do LLDP

Controllers and Registries

- 9 Controllers and Registries +29% from 2020
 Capabilities
- 94% of Controller tests passed
- 66% of Registries partially supporting secured communication (BCP-003-01)

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• 79% Registry tests passed (IS-04)

CYBERSECURITY ASSESSMENT FINDINGS AND RESULTS http://jt-nm.org/jt-nm_tested/

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Cyber Security – Initial Results (see detailed presentation from Gerben Dierick, VRT)

- 145 IP addresses scanned (93 unique devices)
 - 71 scans on media network
 - 74 scans on management network
 - 52 devices on media and management network
 - 22 devices only on management network
 - 19 devices only on media network



Cyber Security – Automated Scanning Results (see detailed presentation from Gerben Dierick, VRT)



Cyber Security – Uneven issues distribution (see detailed presentation from Gerben Dierick, VRT)

Issues not equally distributed over ²⁰ DuTs...

25

15

5

of Vulnerabilities
per category
per device
(no outliers)

Low Medium High Critical

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Cyber Security - Categories of vulnerabilities (see detailed presentation from Gerben Dierick, VRT)

- Almost all vulnerabilities can be put in these categories
 - Unpatched software
 - Unsupported software
 - Encryption misconfiguration
 - Unnecessary features
 - Web interface weaknesses
 - Default credentials
 - Unauthenticated remote access





EARLY CONCLUSIONS AND OUTCOMES http://jt-nm.org/jt-nm_tested/



Early conclusion and outcomes

- It's time for the EBU Pyramid revision.
- JT-NM will look for a way to make the testing more automated and sustainable.
- Extensive NMOS support is essential for future automatable testing. The value of the Badge must be revised and increased.
- The cybersecurity situation hasn't improved a lot needs additional attention.
- Another round of testing may take place in the Summer of 2023, with preparatory exercises to start soon.





Thank you from the JT-NM Tested Team

https://jt-nm.org/jt-nm_tested/



